

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Currently Amended) A connection element for tubes for medical use, comprising:

a main body defining at least one fluid passage between a first opening and a second opening, said second opening being positioned at a first distance from said first opening, said main body being configured to be attachable to the end of a first tube, and

a shut-off element made of an elastically deformable material, said shut-off element being at least partly housed inside the main body, to allow or prevent fluid communication between said first and second openings of the main body, said shut-off element comprising:

a fixing portion engaged on the main body;

an intermediate portion extending from said fixing portion, said intermediate portion having a longitudinal axis of symmetry and being axially deformable;

a sealing portion extending from the intermediate portion and configured to be moved, at least between a first operating condition, in which the sealing portion shuts off the first opening and prevents said fluid communication between the first and second openings, and a second operating condition in which the sealing portion is positioned at a second distance from the first opening to allow fluid communication between said first and second openings; and

an outer surface having a transverse end surface and a lateral surface, said transverse end surface and said lateral surface being configured, in said second operating condition, to be swept by a fluid;

at least said intermediate portion of the shut-off element being configured to deform symmetrically during the transition from said first operating condition to said second operating condition, said intermediate portion presenting a bellows shape to have constant radial dimension during axial deformation.

2. (Previously Presented) A connection element according to claim 1, wherein, in said first operating condition, the sealing portion of the shut-off element cooperates with a leading edge defining said first opening, said sealing portion being positioned level with the leading edge so that the connection element has a continuous distal surface.

3. (Previously Presented) A connection element according to claim 2, wherein, in said first operating condition, the sealing portion of the shut-off element is flush with said leading edge to define a distal surface of the connection element that is smooth and flat or slightly curved.

4. (Canceled.)

5. (Previously Presented) A connection element according to claim 1, wherein said lateral surface constitutes a surface of revolution about said longitudinal axis of symmetry.

6. (Previously Presented) A connection element according to claim 1, wherein the main body defines, in combination with said shut-off element, a fluid

channel having an axial-symmetric configuration with respect to said longitudinal axis of symmetry of the shut-off element said intermediate portion.

7. (Previously Presented) A connection element according to claim 6, wherein the fluid channel has an axial-symmetric configuration with respect to said longitudinal axis of symmetry of said intermediate portion, both in said second operating condition and in said first operating condition.

8. (Previously Presented) A connection element according to claim 1, wherein said main body comprises:

an outer body of essentially tubular configuration, and

a core fixed to the outer body, said core having an attachment portion for the fixing portion of the shut-off element to engage with.

9. (Previously Presented) A connection element according to claim 8, wherein said core extends coaxially with the shut-off element in a radially inward position with respect to the outer body.

10. (Previously Presented) A connection element according to claim 9, wherein said core has a tubular expansion at an axially opposite end from said attachment portion and from said shut-off element.

11. (Previously Presented) A connection element according to claim 10, wherein the main body defines, in combination with said shut-off element, a fluid channel having an axial-symmetric configuration with respect to said longitudinal axis of symmetry of said intermediate portion, both in said second operating condition and in said first operating condition, the fluid channel comprising:

a distal portion extending between said shut-off body and said outer body;

a proximal portion extending inside said tubular expansion, and
a joining portion between said distal and proximal portions of said fluid channel, extending through an intermediate section of the core between said tubular expansion and said attachment portion.

12. (Previously Presented) A connection element according to claim 11, wherein the distal portion of the fluid channel has a radial dimension greater than the proximal portion, said joining portion comprising openings formed on said intermediate section, said openings converging progressively towards said proximal portion of the fluid channel.

13. (Previously Presented) A connection element according to claim 12, wherein the openings formed on said intermediate section are formed in symmetrically opposing pairs with respect to said longitudinal axis of symmetry of said intermediate portion.

14. (Canceled)

15. (Previously Presented) A connection element according to claim 1, further comprising means for removably coupling the main body to an auxiliary connection element connectable to a second tube.

16. (Previously Presented) A connection element according to claim 1, further comprising at least one first annular sealing element engaged on a distal surface of the outside of said main body.

17. (Previously Presented) A connection element according to claim 15, comprising a first annular sealing element engaged on a distal surface of the outside of said main body, and a second annular sealing element engaged on the outside of the

main body at an axial distance from the first sealing element, said means for removably coupling being configured to operate between said first and second annular sealing elements.

18. (Previously Presented) A connection element according to claim 1, wherein said main body includes a rigid material.

19. (Previously Presented) A connection element according to claim 11, wherein said tubular expansion is configured to be engaged to a terminal portion of the first tube.

20. (Previously Presented) A connection element according to claim 11, wherein the sealing portion, the intermediate portion, and the fixing portion are made of a single piece of elastomeric material.

21. (Currently Amended) A connection element according to claim 8, wherein a lateral surface of the outer body presents at least a ~~passage~~ through window, the outer body externally carrying a grip body having at least a radial protrusion passing through said ~~passage~~ through window and joining the external body to the core.

22. (Previously Presented) A connection element according to claim 21, wherein the core has a lateral surface, the lateral surface having a recess that engages said protrusion.

23. (Previously Presented) A connection element according to claim 22, wherein the recess is annular and said protrusion defines an undercut with respect to the outer body.

24. (Previously Presented) A connection element according to claim 21, wherein the lateral surface of the outer body presents a plurality of passages, the outer

body externally carrying the grip body having a corresponding plurality of protrusions passing through said passages and joining the external body to the core.

25. (Previously Presented) An assembling process of a connecting element according to claim 21, comprising the steps of:

preparing the outer body;

preparing the core;

positioning the core coaxially inside the outer body; and

moulding the grip body over the outer body for creating the protrusion extending through said passage, said protrusion engaging said recess thereby axially connecting the core to the outer body.

26. (Previously Presented) A connecting device for tubes for medical use, comprising a connection element in accordance with claim 1.

27. (Previously Presented) A connecting device according to claim 26, comprising an auxiliary connection element connectable to a terminal portion of a second tube and configured to be engaged removably on the main body of said connection element to provide fluid communication between the first tube and the second tube.

28. (Previously Presented) A connecting device according to claim 27, wherein the auxiliary connection element comprises an auxiliary main body defining at least one auxiliary fluid passage and having a coupling portion that mates with said outer body and a male element emerging from a base of said coupling portion, said male element being configured to push said sealing portion of the shut-off member from said second operating condition to said first operating condition.

29. (Previously Presented) A connecting device according to claim 28, wherein the male element is of an axial-symmetric configuration with an axis of symmetry aligned with that of said shut-off element, when the connection element and auxiliary connection element are in mutual engagement.

30. (Previously Presented) A connecting device according to claim 28, wherein the male element comprises a collar with lateral ports arranged symmetrically with respect to said axis of symmetry, for a fluid to pass through.

31. (Previously Presented) A peritoneal dialysis line comprising:
at least one tube configured to be placed in communication with a peritoneum of a patient;
at least one second tube configured to be placed in communication with at least one container of a fluid to be infused into said peritoneum or with a container for draining a fluid coming from the peritoneum; and
a connecting device according to claim 26.

32. (Previously Presented) A tube for a peritoneal dialysis line, comprising at least one terminal portion fitted with a connection element in accordance with claim 1.

33. (Previously Presented) A connection element for tubes for medical use, comprising:
a main body defining at least one fluid passage between a first opening and a second opening, said second opening being positioned at a first distance from said first opening, said main body being configured to be attachable to an end of a first tube, said main body having an outer body of essentially tubular configuration and a core fixed to the outer body;

a shut-off element made of an elastically deformable material, said shut-off element being at least partly housed inside the main body, to allow or prevent fluid communication between said first and second openings of the main body, said shut-off element comprising:

a fixing portion engaged on the main body,

an intermediate portion extending from said fixing portion, said intermediate portion having a longitudinal axis of symmetry and being axially deformable, and

a sealing portion extending from the intermediate portion and configured to be moved, at least between a first operating condition, in which the sealing portion shuts off the first opening and prevents said fluid communication between the first and second openings, and a second operating condition in which the sealing portion is positioned at a second distance from the first opening to allow fluid communication between said first and second openings,

at least said intermediate portion of the shut-off element being configured to deform symmetrically during the transition from said first operating condition to said second operating condition,

said core of the main body extending coaxially with the shut-off element in a radially inward position with respect to said outer body, said core further having an attachment portion for the fixing portion of the shut-off element to engage with, and a tubular expansion at an axially opposite end from said attachment portion and from said shut-off element, and

said main body further defining, in combination with said shut-off element, a fluid channel having an axial-symmetric configuration with respect to said longitudinal axis of symmetry of the intermediate portion, both in said second operating condition and in said first operating condition, the fluid channel comprising:

a distal portion extending between said shut-off body and said outer body,
a proximal portion extending inside said tubular expansion, and
a joining portion between said distal and proximal portions of said fluid channel, said joining portion extending through an intermediate section of the core between said tubular expansion and said attachment portion, said distal portion having a radial dimension greater than the proximal portion, and said joining portion having openings formed on said intermediate section, said openings converging progressively towards said proximal portion of the fluid channel.

34. (Previously Presented) A connection element according to claim 33, wherein the openings formed on said intermediate section are formed in symmetrically opposing pairs with respect to said longitudinal axis of symmetry.

35. (Previously Presented) A connection element according to claim 33, wherein the intermediate portion of the shut-off element is configured to deform axially while maintaining a substantially constant radial dimension, so that said distal portion of the fluid channel has a substantially constant annular cross section.

36. (Previously Presented) A connection element according to claim 33, further comprising means for removably coupling the main body to an auxiliary connection element connectable to a second tube.

37. (Previously Presented) A connection element according to claim 33, further comprising at least one first annular sealing element engaged on a distal surface of the outside of said main body.

38. (Previously Presented) A connection element according to claim 36, comprising a first annular sealing element engaged on a distal surface of the outside of said main body, and a second annular sealing element engaged on the outside of the main body at an axial distance from the first sealing element, said coupling means operating between said first and second annular sealing elements.

39. (Previously Presented) A connection element according to claim 33, wherein said main body includes a rigid material.

40. (Previously Presented) A connection element according to claim 33, wherein said tubular expansion is configured to be engaged to a terminal portion of the first tube.

41. (Previously Presented) A connection element according to claim 33, wherein the sealing portion, the intermediate portion, and the fixing portion are made of a single piece of elastomeric material.

42. (Previously Presented) A connection element according to claim 33, wherein the outer body has a lateral surface, the lateral surface having a passage, the outer body externally carrying a grip body having at least a protrusion passing through said passage and joining the external body to the core.

43. (Previously Presented) A connection element according to claim 42, wherein a lateral surface of the core presents a recess engaging with said protrusion.

44. (Previously Presented) A connection element according to claim 43, wherein the recess is annular and said protrusion defines an undercut with respect to the outer body.

45. (Previously Presented) A connection element according to claim 42, wherein the lateral surface of the outer body presents a plurality of passages, the outer body externally carrying the grip body having a corresponding plurality of protrusions passing through said passages and joining the external body to the core.

46. (Previously Presented) An assembling process of a connecting element according to claim 42, comprising the steps of:

preparing the outer body;

preparing the core;

positioning the core coaxially inside the outer body; and

moulding the grip body over the outer body for creating the protrusion extending through said passage, said protrusion engaging said recess thereby axially connecting the core to the outer body.

47. (Previously Presented) A connecting device for tubes for medical use, comprising a connection element in accordance with claim 33.

48. (Previously Presented) A connecting device according to claim 47, comprising an auxiliary connection element configured to connect to a terminal portion of a second tube and configured to be engaged removably on the main body of said connection element to provide fluid communication between the first tube and the second tube.

49. (Previously Presented) A connecting device according to claim 48, wherein the auxiliary connection element comprises an auxiliary main body defining at least one auxiliary fluid passage, the auxiliary main body having a coupling portion that mates with said outer body, and a male element emerging from a base of said coupling portion, said male element being configured to push said sealing portion of the shut-off member from said second operating condition to said first operating condition.

50. (Previously Presented) A connecting device according to claim 49, wherein the male element has an axial-symmetric configuration with an axis of symmetry aligned with the longitudinal axis of symmetry of said intermediate portion, when the connection element and the auxiliary connection element are in mutual engagement.

51. (Previously Presented) A connecting device according to claim 49, wherein the male element comprises a collar with lateral ports arranged symmetrically with respect to said axis of symmetry of the male element, for a fluid to pass through.

52. (Previously Presented) A peritoneal dialysis line comprising:
at least one tube configured to be placed in communication with a peritoneum of a patient;

at least one second tube configured to be placed in communication with at least one container of a fluid to be infused into said peritoneum or with a container for draining a fluid coming from the peritoneum; and

a connecting device according to claim 47.

53. (Previously Presented) A tube for a peritoneal dialysis line, comprising at least one terminal portion fitted with a connection element in accordance with claim 33.

54-64. (Canceled)

65. (Currently Amended) A connection element for tubes for medical use, comprising:

a main body defining at least one fluid passage between a first opening and a second opening, said second opening being positioned at a first distance from said first opening, said main body being configured to be attachable to an end of a first tube, said main body having an outer body of essentially tubular configuration and a core fixed to and extending inside the outer body;

a shut-off element made of an elastically deformable material, said shut-off element being at least partly housed inside the main body, to allow or prevent fluid communication between said first and second openings of the main body, said shut-off element comprising:

a fixing portion engaged on the main body,

an intermediate portion extending from said fixing portion, said intermediate portion having a longitudinal axis of symmetry and being axially deformable, and

a sealing portion extending from the intermediate portion and configured to be moved, at least between a first operating condition, in which the sealing portion shuts off the first opening and prevents said fluid communication between the first and second openings, and a second operating condition in which the sealing portion is positioned at a second distance from the first opening to allow fluid communication between said first and second openings,

at least said intermediate portion of the shut-off element being configured to deform symmetrically during the transition from said first operating condition to said second operating condition,

said core of the main body having an attachment portion for the fixing portion of the shut-off element to engage with, and

said outer body of the main body having a lateral surface, the lateral surface presenting at least a passage through window, the outer body externally carrying a grip body having at least a radial protrusion passing through said passage through window, the radial protrusion engaging with an annular recess present on the core and joining the external body to the core of the main body.

66. (Previously Presented) A connection element according to claim 65, wherein said core extends coaxially with the shut-off element in a radially inward position with respect to the outer body.

67. (Previously Presented) A connection element according to claim 66, wherein said core has a tubular expansion at an axially opposite end from said attachment portion and from said shut-off element.

68. (Previously Presented) A connection element according to claim 67, wherein the main body defines, in combination with said shut-off element, a fluid channel having an axial-symmetric configuration with respect to said longitudinal axis of symmetry of the intermediate portion, both in said second operating condition and in said first operating condition, the fluid channel comprising:

a distal portion extending between said shut-off body and said outer body;

a proximal portion extending inside said tubular expansion, and

a joining portion between said distal and proximal portions of said fluid channel, said joining portion extending through an intermediate section of the core between said tubular expansion and said attachment portion.

69. (Previously Presented) A connection element according to claim 65, further comprising means for removably coupling the main body to an auxiliary connection element configured to be connected to a second tube.

70. (Previously Presented) A connection element according to claim 65, further comprising at least one first annular sealing element engaged on a distal surface of the outside of said main body.

71. (Previously Presented) A connection element according to claim 69, further comprising a first annular sealing element engaged on a distal surface of the outside of said main body, and a second annular sealing element engaged on the outside of the main body at an axial distance from the first sealing element, said coupling means operating between said first and second annular sealing elements.

72. (Previously Presented) A connection element according to claim 65, wherein said main body includes a rigid material.

73. (Previously Presented) A connection element according to claim 68, wherein said tubular expansion is configured to be engaged to a terminal portion of the first tube.

74. (Previously Presented) A connection element according to claim 68, wherein the sealing portion, the intermediate portion, and the fixing portion are made of a single piece of elastomeric material.

75. (Canceled)

76. (Previously Presented) A connection element according to claim 75, wherein the recess is annular and said protrusion defines an undercut with respect to the outer body.

77. (Currently Amended) A connection element according to claim 65, wherein a lateral surface of the outer body presents a plurality of ~~passages~~ through windows, the outer body externally carrying the grip body having a corresponding plurality of radial protrusions passing through said ~~passages~~ through windows and joining the external body to the core.

78. (Currently Amended) An assembling process of a connecting element according to claim 65, comprising the steps of:

preparing the outer body;
preparing the core;
positioning the core coaxially inside the outer body; and
moulding the grip body over the outer body for creating the radial protrusion extending through said ~~passage~~ through window, said radial protrusion engaging said recess thereby axially connecting the core to the outer body.

79. (Previously Presented) A connecting device for tubes for medical use, comprising a connection element in accordance with claim 65.

80. (Previously Presented) A connecting device according to claim 79, comprising an auxiliary connection element configured to connect to a terminal portion of a second tube and configured to be engaged removably on the main body of said connection element to provide fluid communication between the first tube and second tube.

81. (Previously Presented) A connecting device according to claim 80, wherein the auxiliary connection element comprises an auxiliary main body defining at least one auxiliary fluid passage, the auxiliary main body having a coupling portion that mates with said outer body, and a male element emerging from a base of said coupling portion, said male element being configured to push said sealing portion of the shut-off member from said second operating condition to said first operating condition.

82. (Previously Presented) A connecting device according to claim 81, wherein the male element has an axial-symmetric configuration with an axis of symmetry aligned with the longitudinal axis of symmetry of said intermediate portion, when the connection element and the auxiliary connection element are in mutual engagement.

83. (Previously Presented) A connecting device according to claim 81, wherein the male element comprises a collar with lateral ports arranged symmetrically with respect to said axis of symmetry of said male element, for a fluid to pass through.

84. (Previously Presented) A peritoneal dialysis line comprising:
at least one tube configured to be placed in communication with a peritoneum of a patient;

at least one second tube configured to be placed in communication with at least one container of a fluid to be infused into said peritoneum or with a container for draining a fluid coming from the peritoneum; and

a connecting device according to claim 79.

85. (Previously Presented) A tube for a peritoneal dialysis line, comprising at least one terminal portion fitted with a connection element in accordance with claim 65.

86. (Previously Presented) A connecting device for tubes for medical use, comprising a connection element having:

a main body defining at least one fluid passage between a first opening and a second opening, said second opening being positioned at a first distance from said first opening, said main body being configured to be attachable to an end of a first tube;

a shut-off element made of an elastically deformable material, said shut-off element being at least partly housed inside the main body, to allow or prevent fluid communication between said first and second openings of the main body, said shut-off element comprising:

a fixing portion engaged on the main body;

an intermediate portion extending from said fixing portion, said intermediate portion having a longitudinal axis of symmetry and being axially deformable; and

a sealing portion extending from the intermediate portion and configured to be moved, at least between a first operating condition, in which the sealing portion shuts off the first opening and prevents said fluid communication between the first and second openings, and a second operating condition in which the sealing portion is positioned at a second distance from the first opening to allow fluid communication between said first and second openings;

at least said intermediate portion of the shut-off element being configured to deform symmetrically during the transition from said first operating condition to said second operating condition;

said connecting device further comprising an auxiliary connection element configured to connect to a terminal portion of a second tube and configured to be engaged removably on the main body of said connection element to provide fluid communication between the first tube and the second tube, said auxiliary connection element having an auxiliary main body defining at least one auxiliary fluid passage, said auxiliary main body having a coupling portion that mates with said outer body, and a male element emerging from a base of said coupling portion,

said male element being configured to push said sealing portion of the shut-off member from said second operating condition to said first operating condition, said male element being having an axial-symmetric configuration with an axis of symmetry aligned with that of said intermediate portion, when the connection element and auxiliary connection element are in mutual engagement, said male element further having a collar with lateral ports arranged symmetrically with respect to said axis of symmetry of the male element, for a fluid to pass through.

87. (Previously Presented) A connection element according to claim 86, wherein said core extends coaxially with the shut-off element in a radially inward position with respect to the outer body.

88. (Previously Presented) A connection element according to claim 87,, wherein said core has a tubular expansion at an axially opposite end from said attachment portion and from said shut-off element.

89. (Previously Presented) A connection element according to claim 88, wherein the main body defines, in combination with said shut-off element, a fluid channel having an axial-symmetric configuration with respect to said longitudinal axis of

symmetry of the intermediate portion, both in said second operating condition and in said first operating condition; the fluid channel comprising:

a distal portion extending between said shut-off body and said outer body;
a proximal portion extending inside said tubular expansion, and
a joining portion between said distal and proximal portions of said fluid channel, extending through an intermediate section of the core between said tubular expansion and said attachment portion.

90. (Previously Presented) A connection element according to claim 86, comprising means for removably coupling the main body to an auxiliary connection element configured to connect to a second tube.

91. (Previously Presented) A connection element according to claim 86, comprising at least one first annular sealing element engaged on a distal surface of the outside of said main body.

92. (Previously Presented) A connection element according to claim 90, comprising a first annular sealing element engaged on a distal surface of the outside of said main body, and a second annular sealing element engaged on the outside of the main body at an axial distance from the first sealing element, said coupling means operating between said first and second annular sealing elements.

93. (Previously Presented) A connection element according to claim 86, wherein said main body includes a rigid material.

94. (Previously Presented) A connection element according to claim 89, wherein said tubular expansion is configured to be engaged to a terminal portion of the first tube.

95. (Previously Presented) A connection element according to claim 89, wherein the sealing portion, the intermediate portion, and the fixing portion are made of a single piece of elastomeric material.

96. (Previously Presented) A peritoneal dialysis line comprising:
at least one tube configured to be placed in communication with a peritoneum of a patient;

at least one second tube configured to be placed in communication with at least one container of a fluid to be infused into said peritoneum or with a container for draining a fluid coming from the peritoneum; and

a connecting device according to claim 86.

97. (Previously Presented) A tube for a peritoneal dialysis line, comprising at least one terminal portion fitted with a connection element in accordance with claim 86.